

Standards for IP-telephony

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Standards for IP-telephony

- Introduction, definitions
- Reference configurations
- Technical challenges
- ITU-T IP-project
- Exemples of ITU-standards (H.248,H.323)
- Conclusions

Standards for IP-telephony

▪ References:

- Workshop Background issues paper (ITU-SPU)
- IP-Project (ITU-T/SG13, Report COM13-R68)
- MEDIACOM 2004 Project
(ITU-T SG16, Report COM16- R61)
- ETSI/TIPHON-Project

Definitions

▪ IP-telephony

- services: telephony (incl. Data, fax,..)
- infrastructure: IP-networks involved
- objectives: cost reduction, integration of terminals and services
- market segment: focus residential customers

▪ Voice over IP

- services: voice communications
- infrastructure: IP-network ("Intranet")
- objective: cost reduction, integration of terminals and services
- market segment: focus business customers

Definitions

- **Circuit switching(CS)**
 - connection oriented**: logical connection for the duration of a call
 - Implementations**:
 - >**Public Switched Network(PSTN)**: analog
 - >**Integrated Services Digital Network (ISDN)**: digital
 - Signalling systems**:
 - analog: **CCITT-SS#.....6**
 - digital: **ITU-SS#7**
 - Key Performance parameters**:
 - analog: **delay, noise**
 - digital: **bit errors, phase jitter and wander (phase variations)**

Definitions

- **Packet switching**
 - **connectionless**: no logical connection, packets take different routes between the two users
 - **Packet switched network X.25**: first generation of packet switched data networks (ITU-Recs X....., 197..)
 - **IP networks**: switching of packets with variable length
 - **Signalling systems**: **IP-Protocol**
 - Key Performance parameters**: **packet delay, packet loss, bit errors, phase jitter and wander**

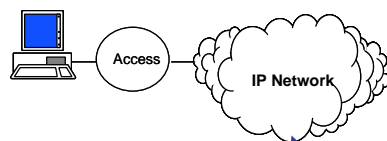
Definitions

▪ Asynchronous Transport Mode (ATM)

- Fixed cell size (cell=packet)
- Connection oriented: logical path, cells take a given route between the two users
- Flexible Bandwidth allocation
- Key Performance parameters: cell delay, cell loss, bit errors, phase jitter and wander
- Applications: mainly in backbone networks (e.g. IP over ATM)

Scenario 1: IP to SCN

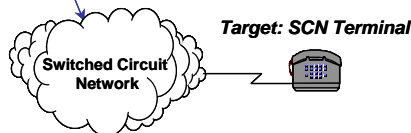
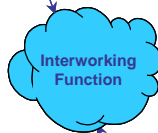
Originator: H.323 Terminal



- Authentication & Authorization of Internet users
- SS7 interworking

Issues:

- How to find appropriate gatekeepers & gateways? (Least-Cost-Routing)
- How do service-providers assure quantifiable QoS across different networks?

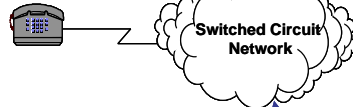


Target: SCN Terminal

Source: ETSI project TIPHON

Scenario 2: SCN to IP

Originator: SCN Terminal



Issues:

- How to translate E.164 numbers into IP addresses? (in other words, how do we find the home-gatekeeper?)
- How to accommodate Roaming IP users?



Issues:

- How to assign E.164 phone numbers to IP Hosts?

Target: H.323 Terminal

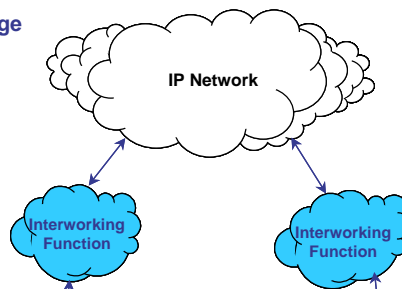
Source: ETSI project TIPHON

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Scenario 3: SCN to IP to SCN

Issues:

- Support of 1 stage dialling
- Finding Gatekeepers & Gateways (Least cost routing)



Originator: SCN Terminal



Issues:

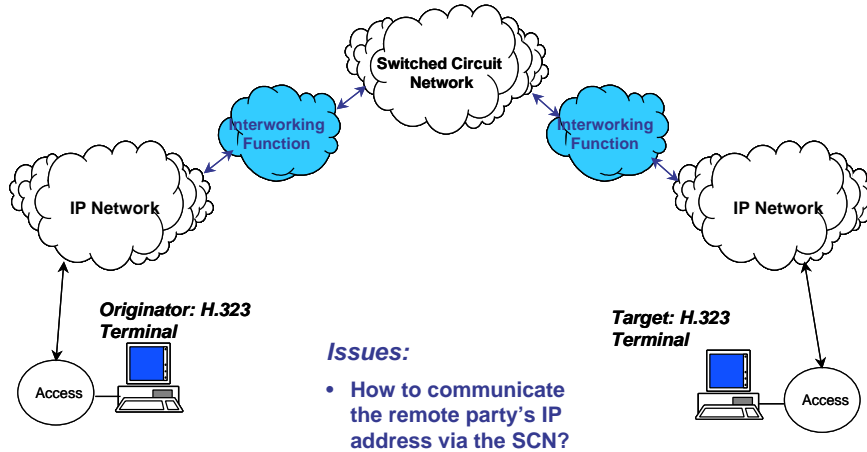
- How to support Network-to-Network information (NNI)?

Target: SCN Terminal

Source: ETSI project TIPHON

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Scenario 4: IP to SCN to IP



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Source: ETSI project TIPHON

Technical Challenges IP-telephony

▪ Services and applications:

-> IP telephony: voice service built on top on data communications

-> New possibilities through:

- Combination voice, data, fax, video
- Improve quality of speech and sound
- Integrated messaging systems

....

▪ Mix of real-time and store-and-forward services!

Technical Challenges IP-telephony

▪ **Packet loss:**

- typical performance question in packet-switched network
- due to congestion in routers (queuing!)
- critical for voice communications
- several techniques to reduce packet loss and to decrease the effects of packet losses

Technical Challenges IP-telephony

- **Packet delay (incl. Jitter/wander):**
 - critical for voice communications (long delay: echo, half-duplex mode)
 - Sources of delay in IP-networks:
 - codec (0 - 40 ms)
 - serialisation delay (< 0.1 ms)
 - queuing delay (routers/gateways)
 - propagation delay (critical for satellites links)
 - solutions: priority mechanisms (DiffServ, RSVP, buffers,)

IP-related activities in ITU-T

- Work performed until 1998 under the **GII umbrella** (specific Project I.1 on IP questions)
- **IP project** (1998, lead SG13 “General Network Aspects)
- **12 work areas identified (I):**
 - Integrated architecture [A1]
 - Impact to telecommunications access infrastructures of access to IP applications [A2]
 - Interworking between IP based network and switched-circuit networks, including wireless based networks [A3]

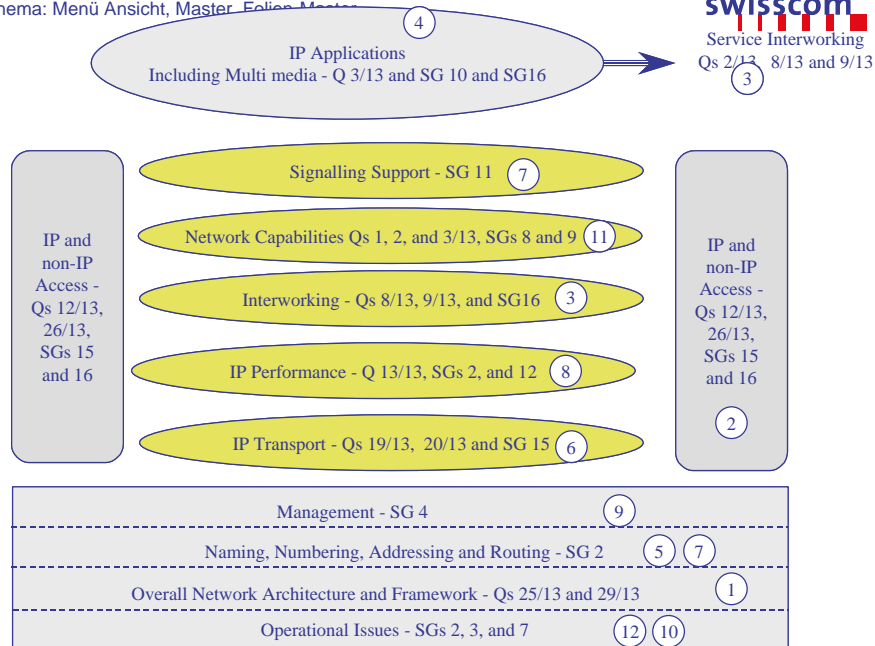
IP-related activities in ITU-T

- **12 work areas identified (II):**
 - Multimedia applications over IP [A.4]
 - Numbering and Addressing [A.5]
 - Transport for IP-structured signals [A.6]
 - Signalling support, IN and routing for services on IP-based networks [A.7]
 - Performance [A.8]

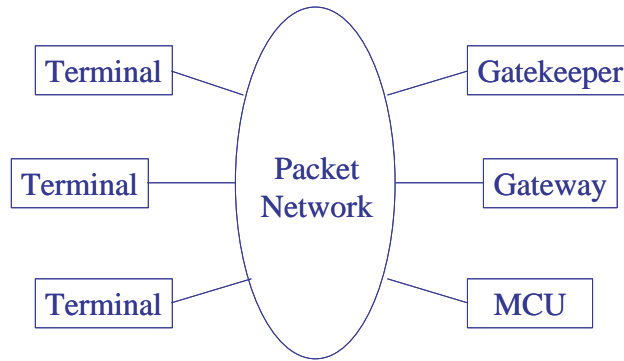
IP-related activities in ITU-T

▪ 12 work areas identified (III):

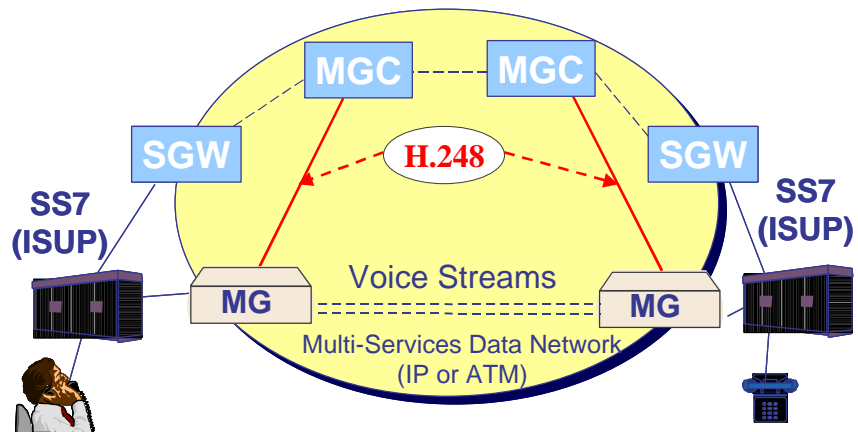
- Integrated management of telecom and IP-based networks [A.9]
- Security aspects [A.10]
- Network capabilities including requirements for resources management [A.11]
- Operations and maintenance for IP [A.12]



H.323 System Elements



H.248: Trunk Gateway Example



Standards for IP-telephony

Conclusions:

- **IP-telephony is a new technology**
« voice on top of data »
- **Key issues are:**
 - Interworking
 - Evolution
 - QoS issues